South Carolina
Department of Education

Good Morning! Please sign-in and get 1 of each handout off the table by the door.

Digging Deep into the Major Work of 6th Grade Math

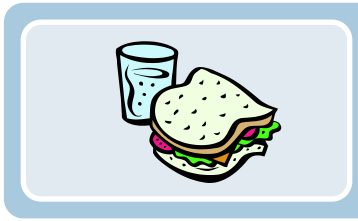
Janel Johnson

March 31, 2014

Logistics

Questions

- Raise your hand and ask questions during the session.
- Parking Lot – questions not directly related to the session

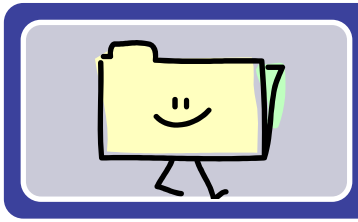


Breaks

- Morning Break and Afternoon Break
- Lunch (30 min)

Technology

- Feel free to take notes on your computer or tablet
- Cell phones on silent



Session Materials

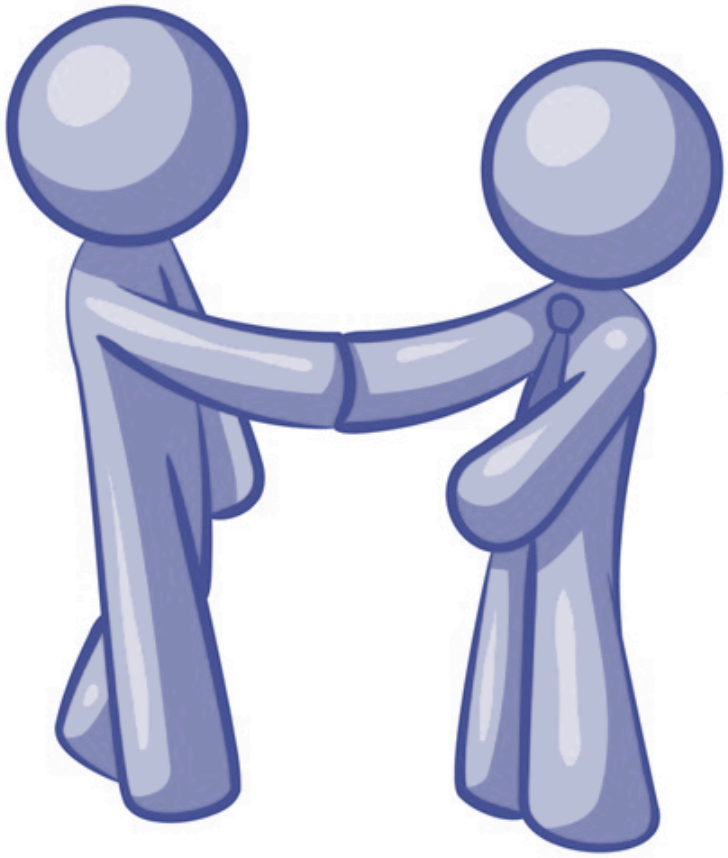
- Located in center of table
- Will be posted on SCDE website and Edmodo Group

Photos: microsoft.com

Introductions

Good Morning!
My name is…

I teach (grade level) at (school) in (district).



My favorite math concept is…

Today I hope to…

Norms

- Listen as an Ally
- Value Differences
- Maintain Professionalism
- Actively Participate

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Agenda

- **Overview of CCSS for Math**
- **Critical Areas**
  - Ratios and Proportional Relationships
  - The Number System
  - Expression and Equations
  - Statistics and Probability
  - Geometry

Critical Areas

- Learning Expectations
- Prior Knowledge
- Connections to Future Learning
- Task/Activity

Agenda (continued)

- Student Misconceptions and Teaching Strategies
- Reflection
- Closing

Objectives

- **IDENTIFY** the critical areas
- **DESCRIBE** the connections concepts have to prior and future courses
- **PRACTICE** tasks and activities aligned to each domain
- **ANALYZE** standards to determine student misconceptions and generate teaching strategies to address them

Mathematical Shifts

Focus

Focus strongly where the standards focus

Coherence

Think across grades, and link to major topics

Rigor

In major topics, pursue conceptual understanding, procedural skill and fluency, and application

Types of Standards

Standards for Mathematical Content

- Skills and understandings students will learn
- Identified by grade level or course

Standards for Mathematical Practice

- Processes and proficiencies that students show when engaged in mathematics
- Identified for students across all grade levels (K–12)

What? vs. How?

While the Content Standards describe what mathematics students should be able to **understand** and **do**, the Mathematical Practices describe **how** students should **engage** with these mathematical concepts and skills.

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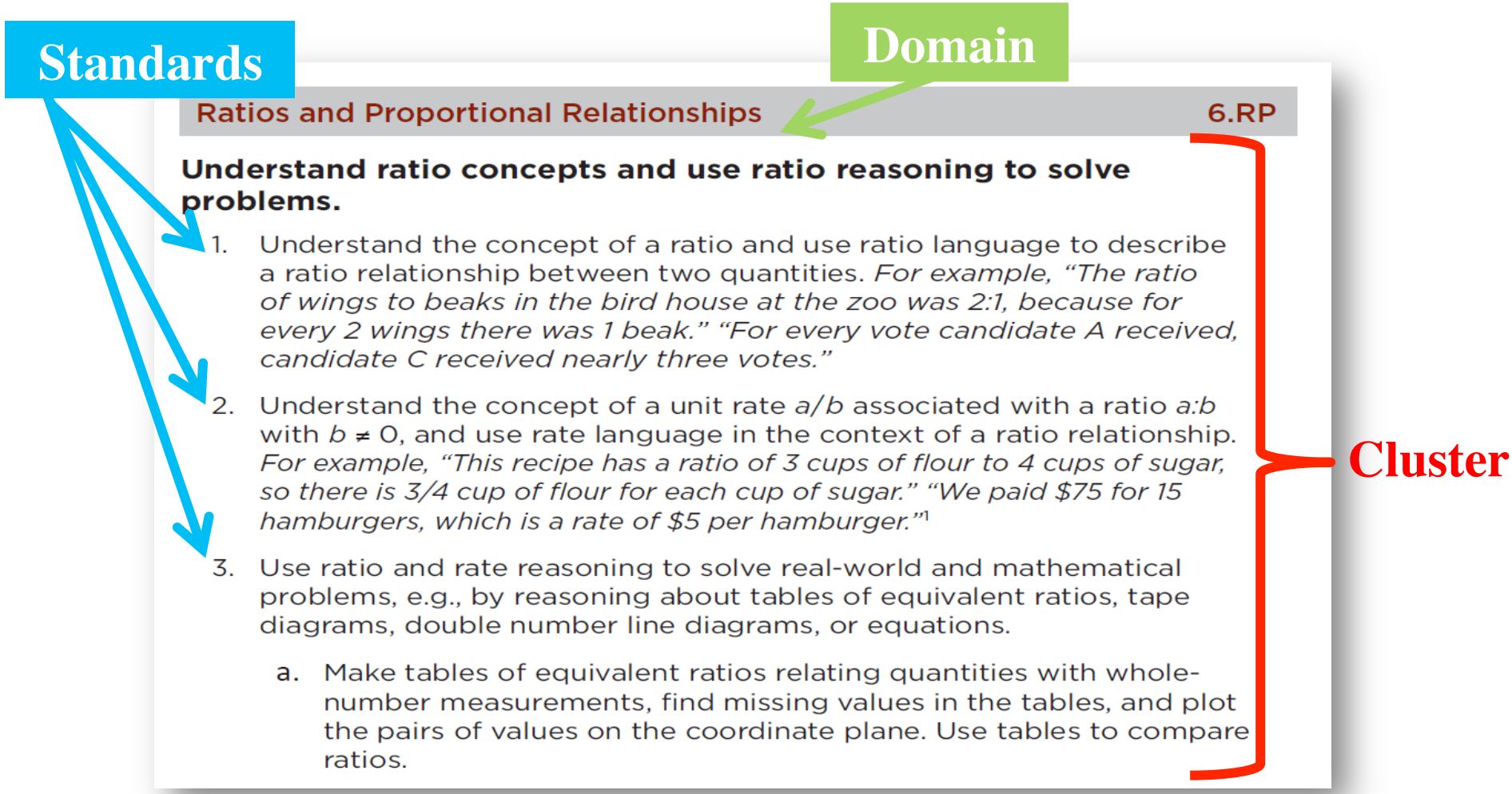
Structure of the Standards



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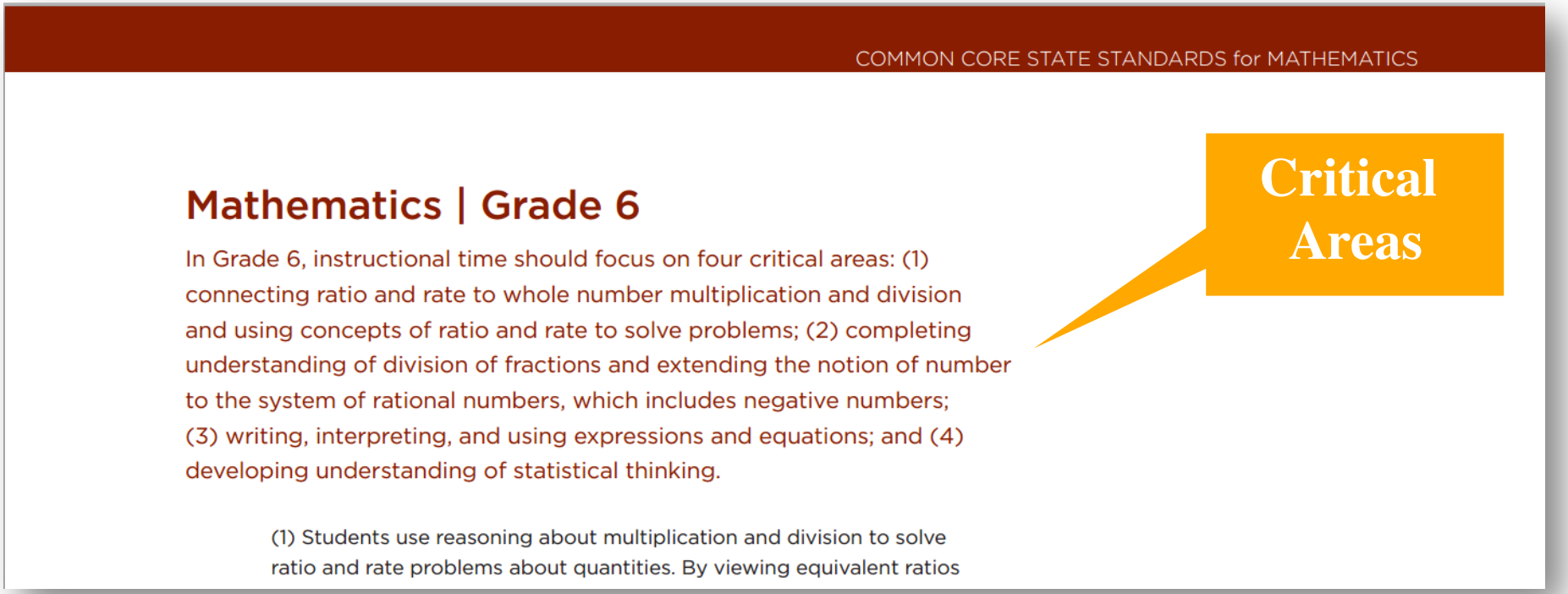
Critical Areas



Critical Areas

In Grade 6, instructional time should focus on four critical areas:

(1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems;

(2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;

(3) writing, interpreting, and using expressions and equations; and

(4) developing understanding of statistical thinking.

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Grades 6-8 Domains

6th Grade	7th Grade	8th Grade
Ratios and Proportional Relationships		Functions
Expressions and Equations		
The Number System		
Statistics and Probability		
Geometry		

Ratios and Proportional Relationships

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems.	6.RP.1 6.RP.2 6.RP.3	**Ratio** • Part to part • Part to whole **Unit Rate** **Percent** • Part to 100	• Create and describe a ratio relationship between two quantities. • Express ratios in different forms. • Understand and derive unit rate. • Determine equivalent ratios; create tables of equivalent ratios. • Use ratio relationships to determine percent, part, or whole. • Apply ratio reasoning when converting units of measurement.

Ratios and Proportional Relationships

What prior knowledge should students have?	How do these concepts support learning in later grades?
• Multiply and divide fractions. • Reduce fractions into lowest terms.	• 7th: Proportions and proportional reasoning

The Best Deal Task

1. Read the task independently.
2. Talk with your partner about a strategy to solve the task.
3. Solve the task with your partner.
4. Compare your strategy and answer with another pair.

Standards Addressed:
6.RP.1, 6.RP.2, 6.RP.3b

The Number System

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers	6.NS.1	**Fraction** • Numerator • Denominator **Division** • Quotient	• Solve complex word problems involving the use of the standard algorithm for dividing fractions by fractions.

The Number System

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers	6.NS.5 6.NS.6 6.NS.7 6.NS.8	**Rational Number Integers** • Positive • Negative **Absolute Value** **Coordinate Plane** • Quadrants • Axes • Origin • Ordered Pairs	• Identify and define a rational number and graph its point on a coordinate plane. • Order rational numbers on a number line. • Understand the absolute value of a number and graph coordinates on a coordinate plane. • Understand the application of all four quadrants in real-world mathematical problems when graphing coordinates on a coordinate plane and finding the distance between two points on the coordinate plane. • Use positive and negative numbers to represent and describe quantities in real-world contexts.

The Number System

What prior knowledge should students have?

- Division of whole number by unit fraction OR a unit fraction by a whole number
- Perform operations through concrete models, visual representations, and standard algorithms
- Plot points in Quadrant 1 of the coordinate plane

How do these concepts support learning in later grades?

- 7th: Operations with rational numbers culminates in grade 7
- 8th: Operations with real numbers

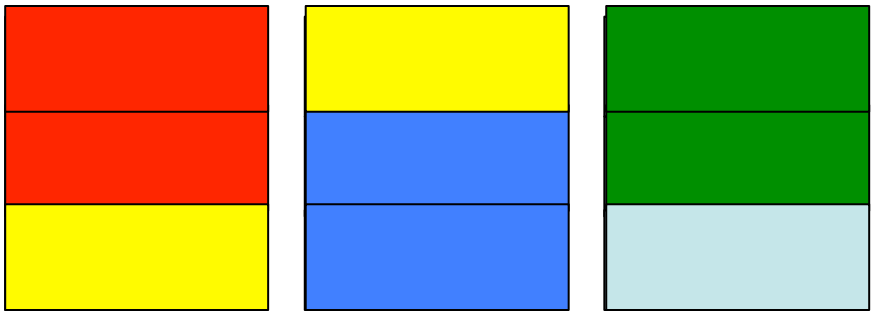
Making Hot Cocoa Task

1. Read the task independently.
2. Talk with your partner about a strategy to solve the task.
3. Solve the task with your partner.
4. Compare your strategy and answer with another pair.

Standards Addressed: 6.NS.1

Making Hot Cocoa Task

a & b.



4½

c & d. $3 \div \frac{2}{3}$

$$\frac{3}{1} \times \frac{3}{2} = \frac{9}{2}$$

4½

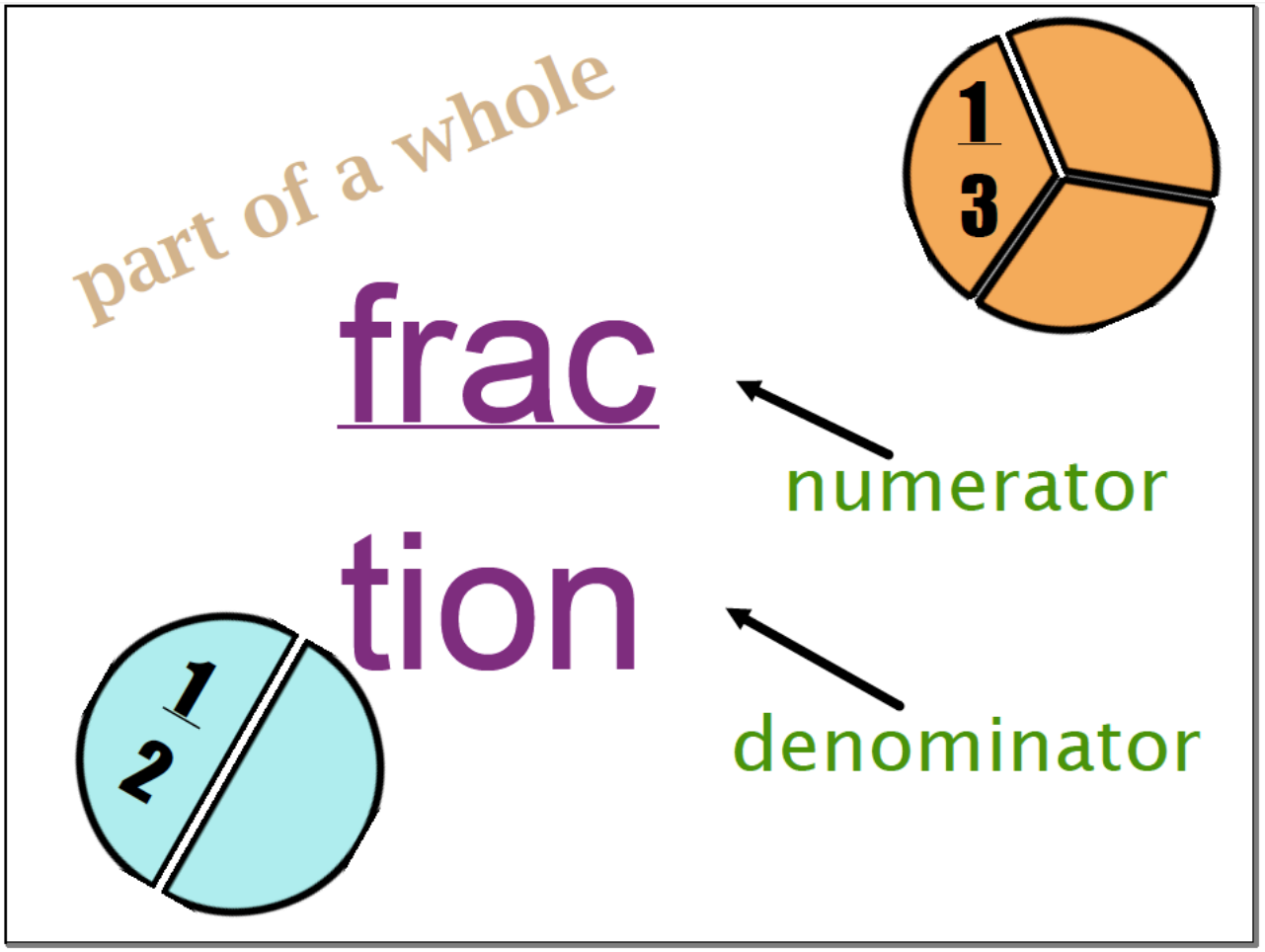
Vocabulary Posters

Potential Discussion Points for Helping Students Think About the Role of Zero in Real-World Contexts

SITUATION	NEGATIVE	ZERO	POSITIVE
Game/Sports: Golf/ Football	Below par / loss of yards	Par/line of scrimmage	Above par / gain of yards
Business	Loss (In the red)	Holding own	Profit (In the black)
Bank Accounts: Checkbooks	Charge- credit card Loans- interest paid / negative balance	Zero balance	Savings / Interest earned / Positive balance
Time and Time Zones	Past / Yesterday	Present / Midnight	Future / Tomorrow
Daylight Savings	Fall behind	Standard time	Spring ahead
Geologic or Historic Time	Before Common Era (B.C.)	Theoretical, but nonexistent year "0"	Common Era (C.E.)
Gauges/Dipsticks for Oil	Oil is low	Correct amount	Over filled
Tires	Flat	Correct pressure	Over inflated
Blood Pressure	Low blood pressure	Correct Pressure	High blood pressure
Eyes-Vision	-3.75	20/20	+3.75
Temperature-Vertical Time Line	Below Zero	Zero	Above zero
Elevation-Altitude	Below sea level	Sea level	Above sea level
Buildings	Basement / Lower levels	Ground floor	Attic / Upper floor

- Vocabulary word
- Definition
- Synonyms
- Picture
- Example

Vocabulary Posters



BREAK

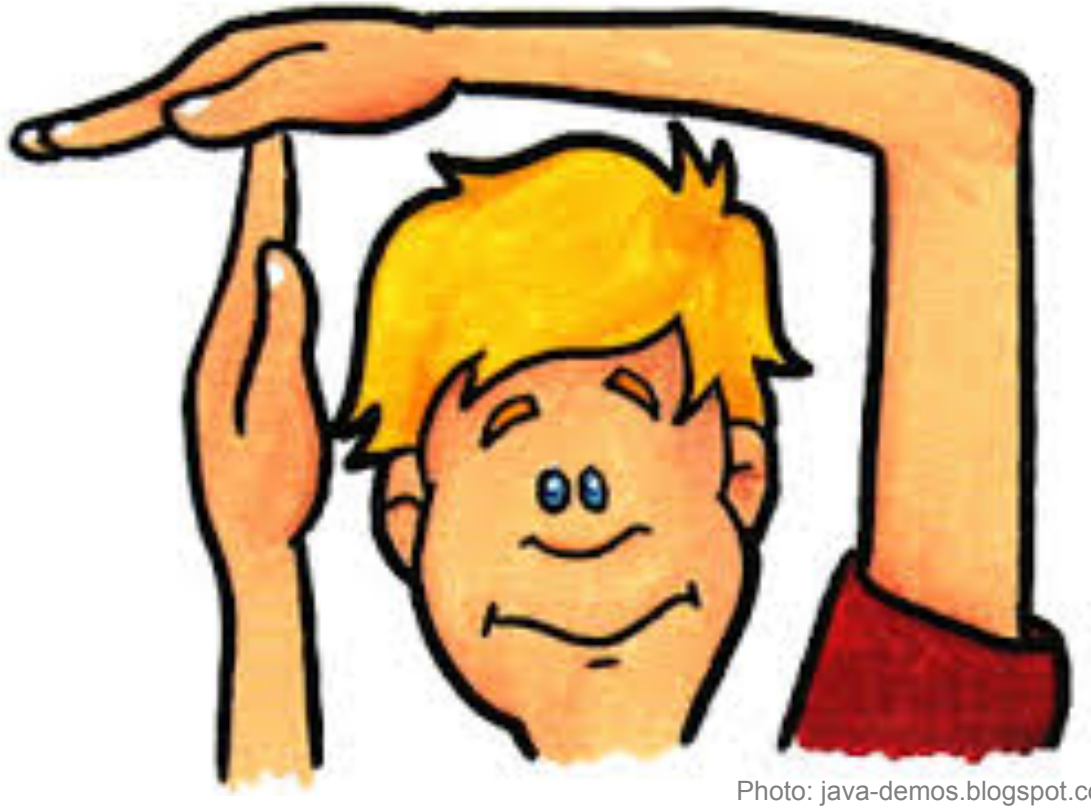


Photo: java-demos.blogspot.com

Expressions and Equations

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Writing, interpreting, and using expressions and equations	6.EE.1 6.EE.2 6.EE.3 6.EE.4	**Expression** • Variable • Coefficient • Term • Operational vocabulary **Order of Operations** **Distributive Property** **Equivalent** **Simplify** **Evaluate**	• Create and evaluate numerical expressions. • Use variables as placeholders for numbers in algebraic expressions. • Create algebraic expressions with one and two variables from word expressions and contexts. • Use mathematical terms to describe expressions. • Apply the Distributive Property to generate equivalent expressions. • Simplify algebraic expressions. • Recognize equivalent expressions.

Expressions and Equations

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Writing, interpreting, and using expressions and equations	6.EE.5 6.EE.6 6.EE.7 6.EE.8	**Equation** • Variable • Coefficient • Term • Operational vocabulary **Inequality** • Solution • Operational vocabulary	• Use variables as placeholders for numbers in algebraic equations and inequalities • Write and solve one-step addition and multiplication equations with nonnegative rational numbers in real-world mathematical problems. • Create inequalities to represent a constraint or condition from context. • Use substitution to determine if a solution makes an inequality true. • Represent solutions of inequalities on number line diagrams.

Expressions and Equations

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Writing, interpreting, and using expressions and equations	6.EE.9	**Dependent Variable** **Independent Variable**	• Write an equation to express one variable in terms of another. • Analyze the relationship between an independent and dependent variable. • Represent and interpret the relationship between two variables in a table, a graph, and an equation

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Expressions and Equations

What prior knowledge should students have?

- Solve Order of Operations problems with brackets and parentheses
- Use whole number exponents to denote powers of ten
- Solve for unknowns in problems
- Commutative and Associative Properties of Addition
- Commutative and Associative Properties of Multiplication
- Generate and analyze patterns that follow a given rule
- Relationships between corresponding terms.

How do these concepts support learning in later grades?

- 7th: Solve numeric and algebraic expressions, equations, and inequalities with rational numbers
- 8th: Integer exponents

Equation Situations Activity

1. With a partner, read each situation card.
2. On a sheet of paper, write an equation that can be used to solve the problem.
3. Be sure to indicate what the variable represents.

Standards Addressed:
6.EE.7

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Distributive Property Number Tiles

For problems 1-4, use the numbers 1-9 to fill in the empty squares. Then, simplify problems 5-8.

Standards Addressed: 6.EE.2

Lunch – 30 minutes

Statistics and Probability

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Developing understanding of statistical thinking	6.SP.1 6.SP.2 6.SP.3 6.SP.4 6.SP.5	**Data Set** **Dot Plots** **Histograms** **Box Plots** **Mean** **Median** **Mode** **Range** **Quartiles**	• Represent data using dot plots, histograms, and box plots. • Determine the appropriate graph for the data set • Compute the mean, median, mode, range, and quartiles • Determine what quantitative measure is the best way to represent a data set • Compare distributions of data

Statistics and Probability

What prior knowledge should students have?

- Data points in a graph.
- Line plots
- Picture graphs
- Bar graphs

How do these concepts support learning in later grades?

- 7th & 8th: Foundational skills for generating statistical questions and looking at the distribution of data to identify measures of center, spread, and overall shape

Sports Plots Task

1. Read the task independently.
2. Talk with your partner about a strategy to solve the task.
3. Solve the task with your partner.

Standards Addressed:
6.SP.4

BREAK

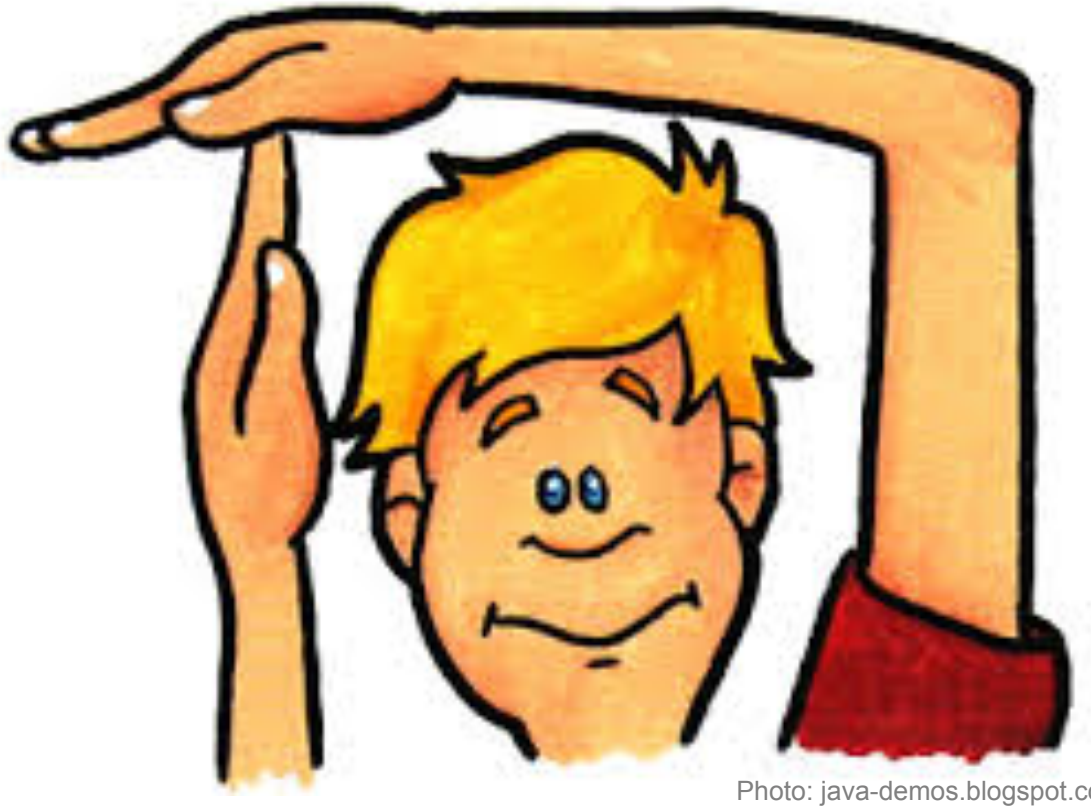


Photo: java-demos.blogspot.com

Geometry

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
	6.G.1 6.G.2 6.G.3 6.G.4	**Area** • Triangles • Quadrilaterals • Polygons **Surface Area** • Cubes • Rectangular Prisms **Volume** • Cubes • Rectangular Prisms	• Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing rectangles or decomposing into triangles. • Recognize the volume of right rectangular prisms through the use of manipulatives and the formula. • Draw polygons on the coordinate plane given vertices. • Determine the length between two points on the coordinate grid (horizontally and vertically). • Create nets made up of rectangles and triangles of three-dimensional figures. • Use nets to find the surface area of rectangles and triangles.

Geometry

What prior knowledge should students have?

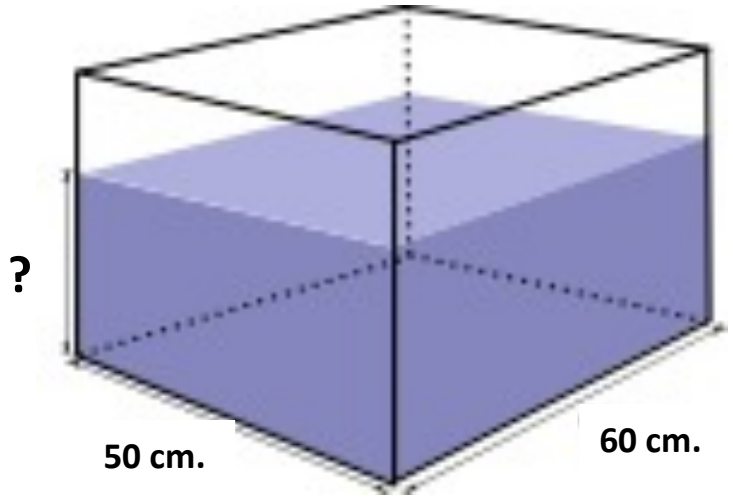
- Area of rectangles
- Understanding of liquid volume
- Measurement for volume of solid figure (cubic units)
- Volume of right rectangular prisms

How do these concepts support learning in later grades?

- 7th & 8th: Surface Area and volume of figures with rational numbers

Computing Volume Task

1. Read the task independently.
2. Talk with your partner about a strategy to solve the task.
3. Solve the task with your partner.
4. Compare your strategy and answer with another pair.



Standards Addressed: 6.G.2

9:53

Student Misconceptions and Teaching Strategies

Analyze the standards in your assigned domain.
Create the chart below for your group's assigned domain.
Post on the wall when finished.

Student Misconceptions	Teaching Strategies
• What are some common misconceptions students have? • What areas do students struggle?	• List teaching strategies and a brief summary of how to address this misconception. • List teaching strategies used to address the domain.

Student Misconceptions and Teaching Strategies

1. Grab a few stick notes.
2. Review each chart posted around the room.
3. On your sticky note, record and post any additional student misconceptions and teaching strategies.

Reflection

How will your knowledge of the Critical Areas help to inform and guide your instruction?

Putting It All Together

The critical areas highlight standards that play an important role in the content at a grade level. They frame important considerations such as time devoted to the standard, amount of student practice, assessment questions, etc.

Suggestions

- Develop long range plans for course content
  - Give focus to the critical areas
- Determine if current instructional materials (unit/lesson plans, books, etc.) meet the demands of CCSS

Objectives

- **IDENTIFY** the critical areas
- **DESCRIBE** the connections concepts have to prior and future courses
- **PRACTICE** tasks and activities aligned to each domain
- **ANALYZE** standards to determine student misconceptions and generate teaching strategies to address them

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Resources

- Illustrative Mathematics
- Utah State Office of Education
- National Council for Teachers of Mathematics
- SCDE Common Core Support Website

Questions

Photo: microsoft.com

Certificates of Attendance

- Survey will be sent to you via e-mail.
- Once complete, your certificate will be sent to you via e-mail.

Exit Ticket

List **3** things you learned today.

List **2** things you will take back and use in your school or district.

List **1** thing you need more information about.

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Contact Information

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